LETTER TO THE EDITOR

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To the Editor:

I am indebted to Dr. David Sencer for a prepublication copy of his Charles Franklin Craig Lecture entitled "Health Protection in a Shrinking World." Dr. Sencer's recommendations regarding yellow fever are of such grave import that I hasten to comment on them, hoping for simultaneous publication. As one who made his first yellow fever field trip in Brazil in 1920 while General William C. Gorgas was still director of The Rockefeller Foundation's campaign for the eradication of yellow fever, and as one who participated for many years in the study and prevention of yellow fever, I cannot remain silent in the face of these surprising proposals. Especially is it important to state that the words of the Director of the National Communicable Disease Center of the Public Health Service do not necessarily constitute a declaration of official policy of the United States Government.

I shall discuss Dr. Sencer's recommendations only as they apply to the nations of the Americas. The Pan-American *Aedes aegypti* eradication campaign antedates by many years the interest of the World Health Organization in *A. aegypti,* stimulated by the epidemics of hemorrhagic fever in Asia. Contrary to Dr. Sencer's opinion, *A. aegypti* eradication does not have to be global to be effective; experience since 1933, when *A. aegypti* eradication began in a few Brazilian cities, has demonstrated that eradication efforts can start small and become large by expanding at the periphery. (Transatlantic and transpacific shipping represents an insignificant risk of reinfestation.)*

The benefits of an eradication campaign become apparent in "eradicated" areas from the beginning. For example, world-wide eradication of smallpox, in which the National Communicable Disease Center is participating, in 18 countries of Africa, was preceded by the Pan-American campaign which dates from 1950. Since 1954 there is no record of smallpox transmission in North America, Central America, or the West Indies; in South America, in 1968, only three cases were reported outside of Brazil, where what should be the final campaign is under way.

Likewise, the almost complete freedom of the Americas from urban yellow fever during the past three decades can be attributed, in my opinion, first, to the elimination of all endemic reservoirs of *aegypti*-transmitted yellow fever (1934) and, second, to the *aegypti* eradication efforts beginning in the 1930s in Brazil, Bolivia, and Perú which resulted eventually in *A. aegypti* being eradicated from the towns and villages of most of the countries subject to jungle yellow fever.

An eradication effort does not have to start large; it must, to be effective, be able to expand over a defensible region. For the eradication of *A. aegypti,*

* After copy for this number had been sent to the printer, Dr. Soper called our attention to a recent report of the importation of *Aedes aegypti* by transatlantic shipping. This report (Pippin, W. F., Thompson, Stephen, and Wilson, Rodney, 1968. The interception of living larvae of *Aedes aegypti* (L.) and *Culex cinerellus* Edw. in aircraft. *Mosq. News, 28:* 646) describes the finding of larvae on a tarpaulin covering cargo shipped from Liberia, West Africa, when the aircraft landed at Forbes Air Force Base, Kansas, on 2 May 1968. Editor.

the Western Hemisphere seems to be, for all practical purposes, such a region.

Should the nations of America follow Dr. Sencer's proposal to abandon the continental campaign for the eradication of *A. aegypti*, they must, as he proposes, accept the risk of the return of urban yellow fever. This risk has been greatly reduced by the eradication of *A. aegypti* in most of the countries in which jungle yellow fever occurs. With the reinfestation of these countries, the risk to them becomes much greater and, secondarily, the threat increases for the islands of the West Indies and for the United States where jungle yellow fever is unknown, but *A. aegypti* abounds.

Dr. Sencer proposes to minimize the risk of urban yellow fever by increased surveillance, with dependence on emergenecy measures, insecticides, and vaccination to suppress incipient epidemics. It is indeed ironic that these proposals should come from a high official of the United States Government. It was Surgeon-General William C. Gorgas of the United States Army who made the first move, as an official delegate of the United States of America to the Second Pan-American Scientific Congress (Washington, December 1915–January 1916), to get the nations of the Americas committed to the eradication of yellow fever. Gorgas used the action of this Congress as an entrée to the health authorities of other countries in promoting the campaign of The Rockefeller Foundation, of which he was the Director until his death in 1920, for the eradication of yellow fever. The present commitment of the nations of the Americas to the eradication of the yellow fever mosquito is a direct outgrowth of that campaign.

The Foundation's campaign succeeded, after almost 20 years of planning and effort, in eliminating the last focus of yellow fever infection in the Americas maintained by man-to-man transmission through *A. aegypti*. This disappearance of the yellow fever of history, the only type of yellow fever known when the eradication effort began, was marred by the discovery of jungle yellow fever, a permanent source of virus for the return of yellow fever to the *aegypti*-infested cities.

The situation of the Foundation's effort was greatly altered by the discovery in 1933 that *A. aegypti* itself could be eradicated. As evidence of the widespread distribution of jungle yellow fever accumulated, and observations of the return of yellow fever to a number of towns from nearby jungle areas were made, it became obvious that the only permanent protection of urban areas from yellow fever lay in the eradication of *A. aegypti*. National eradication programs were undertaken in Brazil, Bolivia, and Perú; from the Bolivian and Brazilian authorities came the resolutions in 1942 and 1947 on which the united effort to eradicate *aegypti* has been based. Historically, then, the continental campaign for the eradication of *aegypti* is an outgrowth of the work of The Rockefeller Foundation, although the Foundation itself never became committed to this objective.

Dr. Sencer proposes intensive surveillance of yellow fever as a means of reducing the risk involved in abandoning the campaign against *A. aegypti*. It is implied that adequate surveillance would guarantee such early notification of infection in cities and towns that emergency measures, such as the application of insecticides and vaccination, could suppress incipient epidemics before significant damage had been done.

This proposal runs counter to decades of experience with yellow fever. The recognition of yellow fever cases in the absence of a recognized outbreak is notoriously difficult, even in classic fatal cases.

The experience of Gorgas and his successors in the Foundation's yellow fever campaign from 1916 to 1930 demonstrated time and again that clinical diagnosis and reporting of yellow fever cannot be relied upon. This cumulative experience led, in 1930, to the introduction of viscerotomy, the routine systematic post-mortem collection of liver tissue for microscopical examination from febrile cases of short duration. Due to the nomadic nature of jungle yellow fever, viscerotomy to be effective must be widespread and carried out over long periods of time. Viscerotomy was responsible in great measure for the demonstration of the final residual silent endemic yellow fever of rural areas infested with *A. aegypti* in northeast Brazil and for the clarification of the epidemiology of jungle yellow fever in South America.

The requirements for successful surveillance of yellow fever include:

1. An experienced medical profession preoccupied with the yellow fever potential;
2. Routine laboratory studies of febrile cases
   a. To isolate yellow fever virus,
   b. To carry out neutralization tests, and
   c. To make accurate microscopical diagnosis of yellow fever liver sections; and
3. Routine viscerotomy for the systematic collection of liver tissue from the bodies of all persons dying after a febrile illness of short duration.

Of these, the most sensitive index is that based on viscerotomy and liver examination. In practice, it is the only method adapted to large-scale application; although some hundreds of thousands of liver tissues have been collected and examined in South America, the organization and administration of viscerotomy is a difficult operation.

It is obvious that the requirements of adequate surveillance will be difficult to meet permanently throughout the yellow fever-susceptible areas of the Americas. In the past 20 years, jungle yellow fever

infection is known to have been present in Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, French Guiana, Guyana, Honduras, México, Nicaragua, Panamá, Paraguay, Perú, Surinam, Trinidad, and Venezuela. But surveillance to be effective must cover not only the areas from which infection may come but the *aegypti*-infested cities and towns subject to infection.

Should it be possible to get satisfactory surveillance, the suggestion that yellow fever can be rapidly dominated by modern methods of insecticide application is based on the assumption that trained and disciplined staff, with the special equipment required and with the proper insecticides, will be immediately available where and when needed. This applies also to vaccination. Contrary to the implications of Dr. Sencer's paper, the continental program for the eradication of *A. aegypti* was promoted many years after the availability of the present yellow fever vaccine, 17D. This vaccine became available for field trials at the end of 1936; it was first used in Brazil in 1937 and 1938. Initial difficulties were overcome, and the vaccine still being used was perfected in 1940. The 17D vaccine is an effective protection for the individuals vaccinated; the jet gun for the application of vaccine would not have solved the difficulties of getting its widescale acceptance in Brazil a generation ago, nor would it do so today.

The Pan-American Health Organization does not limit its interest in yellow fever to the eradication of *A. aegypti*. PAHO collaborates with the health authorities of Brazil and Colombia in the production and free distribution to other countries of the Americas of 17D vaccine in such quantities as may be needed.

It must be emphasized that there is no vaccine for dengue nor for hemorrhagic fever of Asia, which are also transmitted by the *A. aegypti* mosquito. The United States reported almost 30,000 cases of dengue fever in 1963–64 during an island-wide epidemic in Puerto Rico; the reported cases are believed to be but a fraction of those which occurred. The Public Health Service had no practical means of preventing or aborting the epidemic in Puerto Rico.

The Pan-American Sanitary Bureau moved effectively to initiate the continental eradication of *A. aegypti* at the end of 1947 on the basis of what was then known regarding yellow fever. Additional justification of this effort has since come to light. Between 1948 and 1957 yellow fever moved up through Panamá and Central America into México, a region which had apparently been free of infection for over 20 years. Yellow fever also appeared in the Pacific coastal area of Ecuador where the disease had not been recognized since 1920. A third unexpected development during the eradication campaign was the confirmation of yellow fever in Trinidad in 1954 through routine laboratory studies of febrile diseases. This observation came 40 years after the last notification of yellow fever on the island.

The long period of relative freedom from *aegypti*-transmitted yellow fever in the Americas can be attributed in my opinion very largely to the fact that cities and towns near jungle yellow fever areas have generally been free of *A. aegypti*. In my opinion, the long-term continuation of this freedom must be based on the recognition of *A. aegypti* as the enemy to be feared and the enemy to be identified and eliminated, for permanent protection against all threat of yellow fever, dengue, and Asiatic hemorrhagic fever to the increasing urban populations of tropical and subtropical America.

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